## Claims

[c1]

1. An integrated circuit for providing drive signals to a piezo element of a milliactuator device in a mass data storage device, comprising:

SUC

a first circuit for receiving head position control signals and for providing a charging current to a sense capacitor in response thereto;

wherein said first circuit is powered by a voltage supply that is referenced to a substrate potential; and

a second circuit for mirroring a current in said first circuit at a predetermined mirror ratio to provide drive currents to said piezo element.

[c2]

2. The integrated circuit of claim 1 wherein said substrate potential is an analog ground potential.

[c3]

3. The integrated circuit of claim 1 wherein said voltage supply is a voltage supply other than a voltage supply for said piezo element.

[c4]

4. The integrated circuit of claim 1 wherein said predetermined mirror ratio is 10:1.

[c5]

5. The integrated circuit of claim 1 wherein said predetermined mirror ratio is 6.125:1.

[c6]

6. The integrated circuit of claim 1 further comprising:
a first switch connected to selectively disable said first circuit;
a second switch connected to selectively provide a feedback path from said second circuit to an input of said second circuit;
wherein when said first and second switches are selectively operated, said integrated circuit operates in a voltage mode.

[c7]

7. The integrated circuit of claim 1 further comprising servo circuitry integrated therewith.

[c8]

8. A milli-actuator driver for positioning a head of a hard disk drive, comprising:

first integrated circuit means for receiving head position control signals and for

providing a charging current to an external sense capacitor in response thereto; wherein said first integrated circuit means is powered by a voltage supply that is referenced to a substrate potential; and second integrated circuit means for mirroring a current in said first integrated circuit means at a predetermined mirror ratio to provide drive currents to a piezo element.

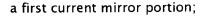
- [c9] 9. The milli-actuator driver of claim 8 wherein said substrate potential is an analog ground potential.
- [c10] 10. The milli-actuator driver of claim 8 wherein said voltage supply is a voltage supply other than a voltage supply for said piezo element.
- [c11] 11. The milli-actuator driver of claim 8 wherein said predetermined mirror ratio is 10:1.
- [c12] 12. The milli-actuator driver of claim 8 wherein said predetermined mirror ratio is 6.125:1.
- [c13] 13. The milli-actuator driver of claim 8 further comprising:

  a first switch connected to selectively disable said first integrated circuit; means
  a second switch connected to selectively provide a feedback path from said
  second integrated circuit means to an input of said second integrated circuit;
  means
  wherein when said first and second switches are selectively operated, said
  integrated circuit operate sin a voltage mode.
- [c14] 14. The milli-actuator driver of claim 8 further comprising servo circuitry integrated therewith.
- [c15]

  15. An integrated circuit for providing drive signals to a piezo element of a milli-actuator device in a mass data storage device to position a data head thereof, comprising:

  a current mirror;

  said current mirror comprising:



said first current mirror portion being configured to receive head position control signals from a head position sensing circuit;

said first current mirror portion being configured to provide a first current in response to said head position control signals for connection to a capacitor; said first mirror portion being powered by a voltage supply that is referenced to a substrate potential;

a second current mirror portion;

connection to said piezo element.

said second current mirror portion being configured to mirror said first current at a predetermined mirror ratio; and said second current mirror being configured to provide drive currents for

- 16. The integrated circuit of claim 15 wherein said substrate potential is an analog ground potential.
- 17. The integrated circuit of claim 15 wherein said voltage supply is a voltage supply other than a voltage supply for said piezo element.
- 18. The integrated circuit of claim 15 wherein said predetermined mirror ratio is [c18]10:1.
  - 19. The integrated circuit of claim 15 wherein said predetermined mirror ratio is 6.125:1.
    - 20. The integrated circuit of claim 15 further comprising: a first switch connected to selectively disable said first current mirror portion a second switch connected to selectively provide a feedback path from said second current mirror portion o an input of said second current mirror portion wherein when said first and second switches are selectively operated, said integrated circuit operate sin a voltage mode.
- 21. The integrated circuit of claim 15 further comprising servo circuitry [c21] integrated therewith.

[c17]

[c19]

[c20]

[c22]	22. A method for operating a milli-actuator driver for a mass data storage
	device, comprising:
	providing a current mirror having first and second current outputs,
	wherein said first and second current outputs have a ratio of 1X:nX;
	wherein said first current output is adapted to be connected to a capacitor;
	wherein said second current output is adapted to be connected to a piezo
	element of milli-actuator; of said mass data storage device
	providing a supply voltage to at least a first portion of said current mirror that is
	referenced to a ground voltage.

- [c23] 23. The method of claim 22 wherein said ground voltage is a substrate potential.
- [c24] 24. The method of claim 22 further comprising configuring said current mirror to have a 1X:nX ratio of 1:10.
- [c25] 25. The method of claim 22 further comprising configuring said current mirror to have a 1X:nX ratio of 1:6.125.
- [c26] 26. The method of claim 22 further comprising:

  providing a first switch connected to selectively disable said first current output of said current mirror.

  providing a second switch connected to selectively provide a feedback path for said second current output of said current mirror.

  wherein when said first and second switches are selectively operated, said milliactuator driver operates in a voltage mode.